UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity) *(Only for new nonprovisional applications under 37 CFR 1.53(b))*	Docket No. NE-1018-US/KM
	Total Pages in this Submission

TO THE ASSISTANT COMMISSIONER FOR PATENTS
Box Patent Application
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

APPARATUS AND METHOD FOR ESTABLISHING DIAL-UP BRANCH CONNECTIONS TO INTERNET SERVICE PROVIDERS

and invented by:

Saburou Ikeda

If a CONTINUATION APPLICATION, *check appropriate box and supply the requisite information:*

☐ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: _____

Which is a:

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Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below

2. ☒ Specification having _____19_____ pages and including the following:

    a. ☒ Descriptive Title of the Invention

    b. ☐ Cross References to Related Applications *(if applicable)*

    c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*

    d. ☐ Reference to Microfiche Appendix *(if applicable)*

    e. ☒ Background of the Invention

    f. ☒ Brief Summary of the Invention

    g. ☒ Brief Description of the Drawings *(if drawings filed)*

    h. ☒ Detailed Description

    i. ☒ Claim(s) as Classified Below

    j. ☒ Abstract of the Disclosure

Application Elements (Continued)

3. ☒ Drawing(s) *(when necessary as prescribed by 35 USC 113)*

    a. ☒ Formal   Number of Sheets   5 (Figs. 1-5)

    b. ☐ Informal   Number of Sheets

4. ☒ Oath or Declaration

    a. ☒ Newly executed *(original or copy)*   ☐ Unexecuted

    b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*

    c. ☒ With Power of Attorney   ☐ Without Power of Attorney

    d. ☐ *DELETION OF INVENTOR(S)*
         Signed statement attached deleting inventor(s) named in the prior application,
         see 37 C.F.R. 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*
    The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied
    under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby
    incorporated by reference therein.

6. ☐ Computer Program in Microfiche *(Appendix)*

7. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all must be included)*

    a. ☐ Paper Copy

    b. ☐ Computer Readable Copy *(identical to computer copy)*

    c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☒ Assignment Papers *(cover sheet & document(s))*

9. ☐ 37 CFR 3.73(B) Statement *(when there is an assignee)*

10. ☐ English Translation Document *(if applicable)*

11. ☐ Information Disclosure Statement/PTO-1449   ☐ Copies of IDS Citations

12. ☐ Preliminary Amendment

13. ☒ Acknowledgment postcard

14. ☐ Certificate of Mailing

        ☐ First Class   ☐ Express Mail *(Specify Label No.):*

P01ULRG/REV04

UTILITY PATENT APPLICATION TRANSMITTAL
(Large Entity)
(Only for new nonprovisional applications under 37 CFR 1.53(b))

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Accompanying Application Parts (Continued)

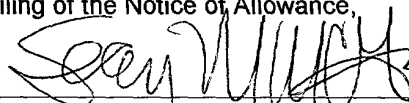15. ☒ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

16. ☐ Additional Enclosures *(please identify below):*

Fee Calculation and Transmittal

CLAIMS AS FILED					
For	**#Filed**	**#Allowed**	**#Extra**	**Rate**	**Fee**
Total Claims	21	- 20 =	1	x $18.00	$18.00
Indep. Claims	5	- 3 =	2	x $78.00	$156.00
Multiple Dependent Claims (check if applicable) ☐					$0.00
				BASIC FEE	$690.00
OTHER FEE *(specify purpose)*		Assignment Recordation			$40.00
				TOTAL FILING FEE	$904.00

☒ A check in the amount of $904.00   to cover the filing fee is enclosed.

☒ The Commissioner is hereby authorized to charge and credit Deposit Account No.   50-0481
   as described below. A duplicate copy of this sheet is enclosed.

     ☐ Charge the amount of   as filing fee.

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     ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Signature

Dated: July 6, 2000

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APPLICATION
FOR
UNITED STATES
LETTERS PATENT

APPLICANT: Saburou Ikeda

FOR: APPARATUS AND METHOD FOR
ESTABLISHING DIAL-UP BRANCH
CONNECTIONS TO INTERNET
SERVICE PROVIDERS

DOCKET NO.:   NE-1018-US/KM

1   <u>TITLE OF THE INVENTION</u>

2   **APPARATUS AND METHOD FOR ESTABLISHING DIAL-UP BRANCH**

3   **CONNECTIONS TO INTERNET SERVICE PROVIDERS**

4   <u>BACKGROUND OF THE INVENTION</u>

5   <u>Field of the Invention</u>

6   The present invention relates generally to dial-up connection to

7   internet service providers, and more particularly to an apparatus and method

8   for accessing multiple internet service providers at low cost by using dial-up

9   IP (internet protocol) service.

10   <u>Description of the Related Art</u>

11   Dial-up IP service allows subscribed user terminals to establish dial-up

12   connections to internet service providers through a public switched telephone

13   network. To provide this service, internet service providers are connected to

14   the public switched telephone network through dial-up lines that are leased

15   from the network provider and assigned phone numbers as in the case of

16   most telephone subscribers. The total number of such leased lines is less than

17   the number of subscribed users in order to establish a reasonable balance

18   between operating cost and profit. However, communication traffic offered

19   to the leased lines as well as to the public switched network will increase

20   significantly when flat rate service is introduced for dial-up connections. In

21   addition, since dial-up users are connected to internet service providers in a

22   one-to-one correspondence, it is necessary for the internet service providers

23   to install equipment in the public switched network that can communicate

24   with the subscribers' modems with perfect compatibility. Further, due to

25   communication protocols and transmission speeds of the installed

1   equipment, the leased lines must be grouped according to such different

2   implementation parameters and reassigned new phone numbers (i.e., pilot

3   numbers) to maintain compatibility. The subscribers must be informed of the

4   reassigned phone numbers to update their internet access number. Since

5   different pilot numbers are used for different groups of leased lines, a split

6   loss occurs in the utilization efficiency of transmission medium. This is

7   particularly true of ADSL (asymmetric digital subscriber line) since the

8   number of lines leased for this service is significantly limited.

9   SUMMARY OF THE INVENTION

10   It is therefore an object of the present invention to provide an

11   apparatus and method for accessing multiple internet service providers with

12   low access charges without generating an extra load on the traffic of public

13   switched network.

14   According to a first aspect, the present invention provides a connection

15   apparatus for a public network switching system which serves user terminals.

16   The apparatus comprises a switching unit having a plurality of diverging ports

17   connected to the switching system and a plurality of converging ports adapted

18   for connection to a plurality of internet lines, and a control unit for receiving a

19   request signal of one of the user terminals and establishing in the switching

20   unit a set of branch connections between one of the diverging ports and ones of

21   the converging ports corresponding to the internet lines specified by the

22   request signal, the one diverging port being connected through a connection to

23   the one user terminal established in the switching system. The switching

24   system may be configured to serve a plurality of internet lines, and the control

25   unit is configured to request the switching system to establish a plurality of

1   connections between the converging ports and the plurality of internet lines.

2   Each of the converging ports may include a multiplexer for multiplexing

3   a plurality of user signals into a signal for transmission to one of the internet

4   lines and a demultiplexer for demultiplexing a signal from the internet line into

5   a plurality of signals for application to the diverging ports.

6   According to a second aspect, the present invention provides a

7   connection apparatus for a public network switching system which serves user

8   terminals via a plurality of ADSL (asymmetric digital subscriber line) modems.

9   The apparatus comprises a switching unit having a first plurality of diverging

10 ports connected to the switching system, a second plurality of diverging ports

11 connected to the ADSL modems, and a plurality of converging ports adapted

12 for connection to a plurality of internet lines, and a control unit for receiving a

13 request signal of one of the user terminals and establishing in the switching

14 unit a first set of branch connections between one of the first plurality of

15 diverging ports and ones of the converging ports corresponding to the internet

16 lines specified by the request signal and a second set of branch connections

17 between one of the second plurality of diverging ports and the ones of the

18 converging ports, the one of the first plurality of diverging ports being

19 connected through a connection established in the switching system to one of

20 the ADSL modems associated with the one user terminal from which the

21 request signal is received.

22   According to a third aspect, the present invention provides a

23 communication system comprising a public network switching system for

24 establishing a connection between a first plurality of ports to which a plurality

25 of user terminals are connected and a second plurality of ports in response to a

1 request signal from one of the user terminals, a switching unit having a

2 plurality of diverging ports connected to the second plurality of ports of the

3 switching system and a plurality of converging ports adapted for connection to

4 a plurality of internet lines, and a control unit responsive to the request signal

5 for establishing in the switching unit a set of branch connections between one

6 of the diverging ports and ones of the converging ports corresponding to the

7 internet lines specified by the request signal, the one diverging port being

8 connected to the one user terminal through the connection established in the

9 switching system.

10   According to a fourth aspect, the present invention provides a method of

11 communication for a public network switching system which serves user

12 terminals by using a switching unit having a plurality of diverging ports

13 connected to the switching system and a plurality of converging ports adapted

14 for connection to a plurality of internet lines. The method comprises the steps

15 of (a) receiving a request signal of one of the user terminals, (b) establishing in

16 the switching system a connection between the one user terminal and one of

17 the plurality of diverging ports in response to the request signal, (c)

18 establishing in the switching system a plurality of connections in the public

19 network switching system between ones of the plurality of converging ports

20 and the plurality of internet lines according to phone numbers of internet

21 service providers contained in the request signal, (d) establishing in the

22 switching unit a set of branch connections between the one diverging port and

23 the ones of the converging ports, and (e) repeating the steps (a), (b) and (d) by

24 skipping the step (c) if connections are already established in the public

25 network switching system.

1   <u>BRIEF DESCRIPTION OF THE DRAWINGS</u>

2   The present invention will be described in further detail with reference

3   to the accompanying drawings, in which:

4   Fig. 1 is a block diagram of a communication network incorporating a

5   branch connection apparatus of the present invention;

6   Fig. 2 is a block diagram of the branch connection apparatus of Fig. 1;

7   Fig. 3 is a flowchart of the control unit of the branch connection

8   apparatus;

9   Fig. 4 is a block diagram of a communication network in which the

10   branch connection apparatus of this invention is combined with high speed

11   interfaces such as asymmetric digital subscriber lines; and

12   Fig. 5 is a block diagram of the branch connection apparatus of Fig. 4.

13   <u>DETAILED DESCRIPTION</u>

14   In Fig. 1, a communication network is illustrated as comprising a

15   switch fabric 10 and a call processor 11 which together form an essential part

16   of a PSTN (public switched telephone network) local switching office. Switch

17   fabric 10 has a plurality of line ports $L_{U1} \sim L_{UM}$ (or subscriber line interfaces)

18   connected respectively to user terminals $12_1 \sim 12_M$ and a plurality of trunk

19   ports $T_{P1} \sim T_{PN}$ (or trunk interfaces) respectively connected to the

20   transmission lines of internet service providers $13_1 \sim 13_N$. For simplicity, the

21   trunk ports are provided one for each internet service provider. More than

22   one trunk port may be provided for each internet service provider.

23   According to the present invention, a branch connection apparatus 15

24   is provided. Branch connection apparatus 15 may be co-located with the

25   switching system of the local switching office or located outside of the

1 switching office in an appropriate housing unit. Branch connection

2 apparatus 15 includes a switching unit 16 and a control unit 17. Switching

3 unit 16 has a plurality of diverging ports $D_1 \sim D_M$ connected to trunk ports T_1

4 $\sim T_M$ of the switch fabric 10 and a plurality of converging ports $C_1 \sim C_N$

5 connected to line ports $L_1 \sim L_N$ of the switch fabric 10. The converging ports

6 of the switching unit 16 are provided in a one-to-one correspondence to the

7 internet service providers $13_1 \sim 13_N$. If all user terminals 12 are subscribed to

8 a flat rate service, all diverging ports of switching unit 16 correspond

9 respectively to the user terminals $12_1 \sim 12_M$. Switching unit 16 has a

10 dedicated input port connected via a control line 18 to a line port of the

11 switch fabric 10 through which the control unit 16 communicates with the

12 call processor 11 to set up connections in the switch fabric 10.

13 As shown in detail in Fig. 2, the switching unit 16 includes a plurality

14 of line interface units 20-1 through 20-M for interfacing the trunk ports of

15 switch fabric 10 to corresponding line ports of a switch fabric 22. Each line

16 interface unit 20 represents the corresponding one of diverging ports $D_1 \sim$

17 D_M. Switch fabric 22 has N sets of trunk ports with which a plurality of

18 multiplexers/demultiplexers 23-1 through 23-N are associated respectively.

19 Each of the multiplexers/demultiplexers has a number of input terminals

20 connected to corresponding trunk ports of the associated set and one output

21 terminal connected to a corresponding one of line interface units 24-1 ~ 24-N,

22 which operate in compliance with communication protocols and

23 transmission speeds of the user terminals. These line interface units are

24 connected to line ports $L_1 \sim L_N$ of the switch fabric 10 for interfacing to the

25 internet service providers. Each multiplexer/demultiplexer 23 and

1   corresponding line interface unit 24 represent the corresponding one of the

2   converging ports $C_1 \sim C_N$.

3   In a preferred embodiment, each multiplexer/demultiplexer is

4   implemented with a processor operating in a TCP/IP (Transmission Control

5   Protocol/Internet Protocol) protocol mode or an ATM (asynchronous transfer

6   mode) mode.

7   Control unit 17 includes a processor 30 and a number of memories 31

8   through 33 for storing ISP (internet service provider) phone numbers, user

9   phone numbers, and user identifiers/passwords. Using the memories 31

10   through 33, the processor 30 determines whether the requesting user is a

11   registered user. Processor 30 communicates with each internet service

12   provider through the line interface units 24 to ascertain that the requesting

13   user is to be allowed access to the Internet. Processor 30 uses a line interface

14   unit 21 to supply a connection setup request to the control processor 11 via

15   the control line 18 when establishing connections in the switch fabric 10.

16   When one of the user terminals desires to access the Internet, it sends a

17   connection request packet. This packet is received by the call processor 11 of

18   the PSTN switching system and a connection is established in the switch

19   fabric 10 between the line terminal L_U of the calling user and one of the trunk

20   ports $T_1 \sim T_M$. The request packet is passed on through the control line 18 to

21   the line interface unit 21 of the switching unit 16, where it is communicated

22   to the processor 30. The request packet from the calling user contains a

23   number of destination (ISP) phone numbers and the phone number of the

24   calling user terminal. These phone numbers are detected by the processor 30.

25   The operation of processor 30 proceeds according to a programmed

1   routine described in the flowchart of Fig. 3. When a call is received from a

2   user terminal (step 41), the processor 30 proceeds to detect all phone numbers

3   contained in the data received from the line interface 20 of the calling user

4   terminal (step 42). At step 43, the phone number of the calling user is

5   checked against phone numbers stored in the ISP phone number 31. If there is

6   a match, if they mismatch with the stored ISP phone numbers, the processor

7   30 recognizes that the request cannot accepted and terminates the routine.

8   Otherwise, the processor advances to next decision step 44 to compare the

9   phone number of the calling user with the phone numbers stored in the user

10   phone number memory 32 to determine whether the calling user is

11   authorized to gain access to the Internet.

12   If it is determined that the calling user is an authorized subscriber, the

13   processor 30 proceeds from step 44 to step 45 to determine whether desired

14   connections are already established in the switch fabric 10. If not, the

15   processor 30 proceeds to step 46 to send a connection setup request to the call

16   processor 11 to establish connections in the switch fabric 10 between line

17   ports $L_1 \sim L_N$ and trunk ports $TP_1 \sim T_{PN}$. The number of such connections is

18   determined by the phone numbers contained in the user's connection request.

19   At step 47, the processor 30 communicates through the line interface units 24

20   to obtain call restriction data and compares the phone number of the calling

21   user with the phone numbers contained in the restriction data. It there is a

22   match, the processor 30 recognizes that the user is denied access to the

23   Internet. Otherwise, the processor 30 recognizes that the user is allowed to

24   access the Internet and proceeds to step 48 to control the switch fabric 22 to

25   establish a set of branch connections between one of the diverging ports of the

1 switching unit 16 and a number of converging ports determined by the phone

2 numbers of internet service providers contained in the received packet.

3   If the decision at step 45 is affirmative, the processor 30 skips step 46

4 With the connections established in both switch fabrics 10 and 22, the routine

5 is then terminated.

6   If the decision at step 44 indicates that there is a mismatch between the

7 calling user's phone number and the subscribed phone numbers, flow

8 proceeds to step 49 to send a request packet to the calling user terminal via

9 the associated line interface unit 20 to return a response containing a user's

10 identifier (ID) and a user's password. If a response is returned (step 50), the

11 processor 30 compares the data stored in the user ID/password memory 33

12 (step 51). If a match is detected in step 51, the processor proceeds to step 45.

13 Otherwise the routine is terminated.

14   It will be seen from the foregoing that, if the user terminal 12_1 initially

15 sends a connection request packet to the network, requesting a set of N

16 "branch connections" to internet service providers $13_1 \sim 13_N$. If the

17 requesting user is authenticated, N paths are established in the switch fabric

18 10 between line ports $L_1 \sim L_N$ and trunk ports $T_{P1} \sim T_{PN}$ and a set of N branch

19 connections is established in the switching unit 16 between the diverging port

20 D_1 and the converging ports $C_1 \sim C_N$, as indicated by thick dotted lines in Fig.

21 1. If the user terminal 12_2 subsequently sends a connection, requesting an

22 identical set of branch connections, and is then authenticated, a set of branch

23 connections is established in the switch fabric 22. In the latter case, necessary

24 connections are already established in the switch fabric 10. Thus, step 46 is

25 skipped.

1   As a result, (2 x N) paths are set up in the switching unit 16 and (2 + N)

2   paths are set up in the switch fabric 10 for the user terminals 12_1 and 12_2. If

3   these connections were established without using the branch connection

4   apparatus 15, (2 x N) paths must be established in the switch fabric 10. If

5   there are M user terminals simultaneously requesting identical branch

6   connections for N internet service providers, (M x N) paths will be

7   established in the switching unit 16 and (M + N) paths will be established in

8   the switch fabric 10. Since in most cases the product (M x N) is considerably

9   greater than the sum (M + N), the branch connection apparatus 15 can

10   significantly relieve the switch fabric 10 of the burden of establishing

11   "branch-connection" paths.

12   In addition, each of the transmission (access) lines between the switch

13   fabric 10 and the internet service providers 13 is always lightly loaded with

14   traffic. Therefore, the access line of each internet service provider can

15   support the multiplexed traffic of a number of user terminals. Further, due to

16   the significant increase in the utilization efficiency of the access lines, internet

17   service providers are relieved of the burden of paying high access charges for

18   providing flat rate services to internet subscribers.

19   In a modified embodiment, the converging ports of the branch

20   connection apparatus 15 may be connected direct to the internet service

21   providers.

22   Figs. 4 and 5 illustrate a modified embodiment of the present invention

23   in which the end points of subscriber access lines are terminated with ADSL

24   (asymmetric digital subscriber line) modems $60_1 \sim 60_M$ and $61_1 \sim 61_M$. High

25   speed signals from the ADSL modems $61_1 \sim 61_M$ are connected by lines 62 to

1   converging ports $AD_1 \sim AD_M$ of the switching unit 16 and their low speed

2   signals such as speech signals are supplied to corresponding line ports of the

3   switch fabric 10 for transmission over the Internet using a protocol known as

4   VoIP (voice over IP). High speed signals at the diverging ports $AD_1 \sim AD_M$

5   are coupled through line interface units 70-1 ~ 70-M (Fig. 5) to line ports of

6   the switch fabric 22.

7   If the user terminal 12_2 sends a connection request to the network,

8   requesting a conference call, for example, and ADSL connections to different

9   internet service providers, the call processor 11 establishes a connection 63 in

10   the switch fabric 10 between the ADSL modem 61_2 and the diverging port D_2

11   of the switching unit 16. The connection request is passed on from the call

12   processor 11 to the processor 30 via the control line 18. In response, the

13   processor 30 requests the call processor 11 to establish connections 64 in the

14   switch fabric 10 and then establishes a first set of branch connections between

15   the diverging port D_2 and the converging ports $C_1 \sim C_N$ and a second set of

16   branch connections between the diverging port AD_2 and the converging ports

17   $C_1 \sim C_N$. The speech signal of user terminal 12_2 is split at the diverging port

18   D_2 and the high speed signal of the user is split at the diverging port AD_2. At

19   the converging ports $C_1 \sim C_N$, the split speech signals and the split high speed

20   signals are multiplexed and transmitted to the IP network 13 through the

21   connections 64.

What is claimed is:

1.   A connection apparatus for a public network switching system
which serves user terminals, the apparatus comprising:

a switching unit having a plurality of diverging ports connected to the
switching system and a plurality of converging ports adapted for connection to
a plurality of internet lines; and

a control unit for receiving a request signal of one of said user terminals
and establishing in said switching unit a set of branch connections between one
of said diverging ports and ones of said converging ports corresponding to the
internet lines specified by said request signal, said one diverging port being
connected through a connection to said one user terminal established in said
switching system.

2.   The connection apparatus of claim 1, wherein said switching
system is configured to serve a plurality of internet lines, and wherein said
control unit is configured to request said switching system to establish a
plurality of connections between said plurality of converging ports and said
plurality of internet lines.

3.   The connection apparatus of claim 1, wherein each of said plurality
of converging ports includes a multiplexer for multiplexing a plurality of user
signals into a signal for transmission to one of said internet lines.

4.   The connection apparatus of claim 3, wherein each of said plurality

2   of converging ports further includes a demultiplexer for demultiplexing a

3   signal from said one internet line into a plurality of signals for application to

4   said diverging ports.

1   5.   The connection apparatus of claim 3, wherein said multiplexer is

2   configured to operate in a TCP/IP protocol mode.

1   6.   The connection apparatus of claim 4, wherein said demultiplexer is

2   configured to operate in a TCP/IP protocol mode.

1   7.   The connection apparatus of claim 3, wherein said multiplexer is

2   configured to operate in an ATM mode.

1   8.   The connection apparatus of claim 4, wherein said demultiplexer

2   multiplexer is configured to operate in an ATM mode.

1   9.   The connection apparatus of claim 3, wherein each of said plurality

2   of diverging ports includes a first line interface unit for interfacing the

3   switching unit to said switching system and each of said converging ports

4   further includes a second line interface unit for interfacing the multiplexer to

5   said one internet line.

1   10.   The connection apparatus of claim 9, wherein said second line

2   interface unit is in compliance with communication protocol and transmission

3   speed of one of said user terminals.

1   11.   The connection apparatus of claim 9, wherein said second line

2 interface unit is configured to interface the demultiplexer to said one internet

3 line.

1   12.   The connection apparatus of claim 1, wherein said control unit

2 comprises:

3   a phone number memory for storing a plurality of phone numbers; and

4   a processor for determining whether a phone number contained in said

5 request signal coincides with one of said phone numbers stored in said phone

6 number memory and establishing said set of branch connections if the phone

7 number coincides with one of the stored phone numbers.

1   13.   The connection apparatus of claim 12, wherein said control unit

2 further comprises an ID/password memory for storing a plurality of user

3 identifiers and user passwords, and wherein said processor is configured to:

4   determine whether a user identifier and a user password contained in

5 said request signal coincide with one of the user identifiers and one of the user

6 passwords stored in said ID/password memory if the phone number contained

7 in said request signal does not coincide with any of the stored phone numbers,

8 and

9   establish said set of branch connections if the user identifier and the user

10 password contained in the request signal coincide with one of the stored user

11 identifiers and one of the stored user passwords.

1   14.   The connection apparatus of claim 13, wherein said processor is

2   configured to:

3   determine whether the phone number contained in said request signal

4   coincides with a phone number which is denied access to the internet lines, and

5   establish said set of branch connections if the phone number contained

6   in said request signal does not coincides with said phone number which is

7   denied access to the internet lines.

1   15.   A connection apparatus for a public network switching system

2   which serves user terminals via a plurality of ADSL (asymmetric digital

3   subscriber line) modems, the apparatus comprising:

4   a switching unit having a first plurality of diverging ports connected to

5   the switching system, a second plurality of diverging ports connected to said

6   ADSL modems, and a plurality of converging ports adapted for connection to a

7   plurality of internet lines; and

8   a control unit for receiving a request signal of one of said user terminals

9   and establishing in said switching unit a first set of branch connections

10   between one of said first plurality of diverging ports and ones of said

11   converging ports corresponding to the internet lines specified by said request

12   signal and a second set of branch connections between one of said second

13   plurality of diverging ports and said ones of said converging ports, said one of

14   the first plurality of diverging ports being connected through a connection

15   established in said switching system to one of said ADSL modems associated

16   with said one user terminal from which said request signal is received.

1   16.   The connection apparatus of claim 15, wherein said switching

2 system is configured to serve a plurality of internet lines, and wherein said

3 control unit is configured to request said switching system to establish a

4 plurality of connections between said plurality of converging ports and said

5 plurality of internet lines.

1   17. A communication system comprising:

2   a public network switching system for establishing a connection between

3 a first plurality of ports to which a plurality of user terminals are connected

4 and a second plurality of ports in response to a request signal from one of said

5 plurality of user terminals;

6   a switching unit having a plurality of diverging ports connected to said

7 second plurality of ports of said switching system and a plurality of converging

8 ports adapted for connection to a plurality of internet lines; and

9   a control unit responsive to said request signal for establishing in said

10 switching unit a set of branch connections between one of said diverging ports

11 and ones of said converging ports corresponding to the internet lines specified

12 by said request signal, said one diverging port being connected to said one user

13 terminal through said connection established in said switching system.

1   18. The communication system of claim 17, wherein said switching

2 system is configured to serve a plurality of internet lines, and wherein said

3 control unit is configured to request said switching system to establish a

4 plurality of connections between said plurality of converging ports and said

5 plurality of internet lines.

1   19.   A communication system comprising:

2   a plurality of ADSL (asymmetric digital subscriber line) modems;

3   a public network switching system for establishing a connection between

4   a first plurality of ports to which said ADSL modems are connected and a

5   second plurality of ports in response to a request signal from one of said ADSL

6   modems;

7   a switching unit having a first plurality of diverging ports connected to

8   said second plurality of ports of said switching system, a second plurality of

9   diverging ports connected to said ADSL modems, and a plurality of converging

10   ports adapted for connection to a plurality of internet lines; and

11   a control unit for receiving a request signal of one of said user terminals

12   and establishing in said switching unit a first set of branch connections

13   between one of said first plurality of diverging ports and ones of said

14   converging ports corresponding to the internet lines specified by said request

15   signal and a second set of branch connections between one of said second

16   plurality of diverging ports and said ones of said converging ports, said one of

17   the first plurality of diverging ports being connected through a connection

18   established in said switching system to one of said ADSL modems associated

19   with said one user terminal from which said request signal is received.

1   20.   The communication system of claim 19, wherein said switching

2   system is configured to serve a plurality of internet lines, and wherein said

3   control unit is configured to request said switching system to establish a

4   plurality of connections between said plurality of converging ports and said

5   plurality of internet lines.

1   21.   A method of communication for a public network switching system

2 which serves user terminals by using a switching unit having a plurality of

3 diverging ports connected to the switching system and a plurality of

4 converging ports adapted for connection to a plurality of internet lines, the

5 method comprising the steps of:

6   a)   receiving a request signal of one of said user terminals;

7   b)   establishing in said switching system a connection between said

8 one user terminal and one of said plurality of diverging ports in response to

9 said request signal;

10   c)   establishing in said switching system a plurality of connections in

11 said public network switching system between ones of said plurality of

12 converging ports and said plurality of internet lines according to phone

13 numbers of internet service providers contained in said request signal;

14   d)   establishing in said switching unit a set of branch connections

15 between said one diverging port and said ones of said converging ports; and
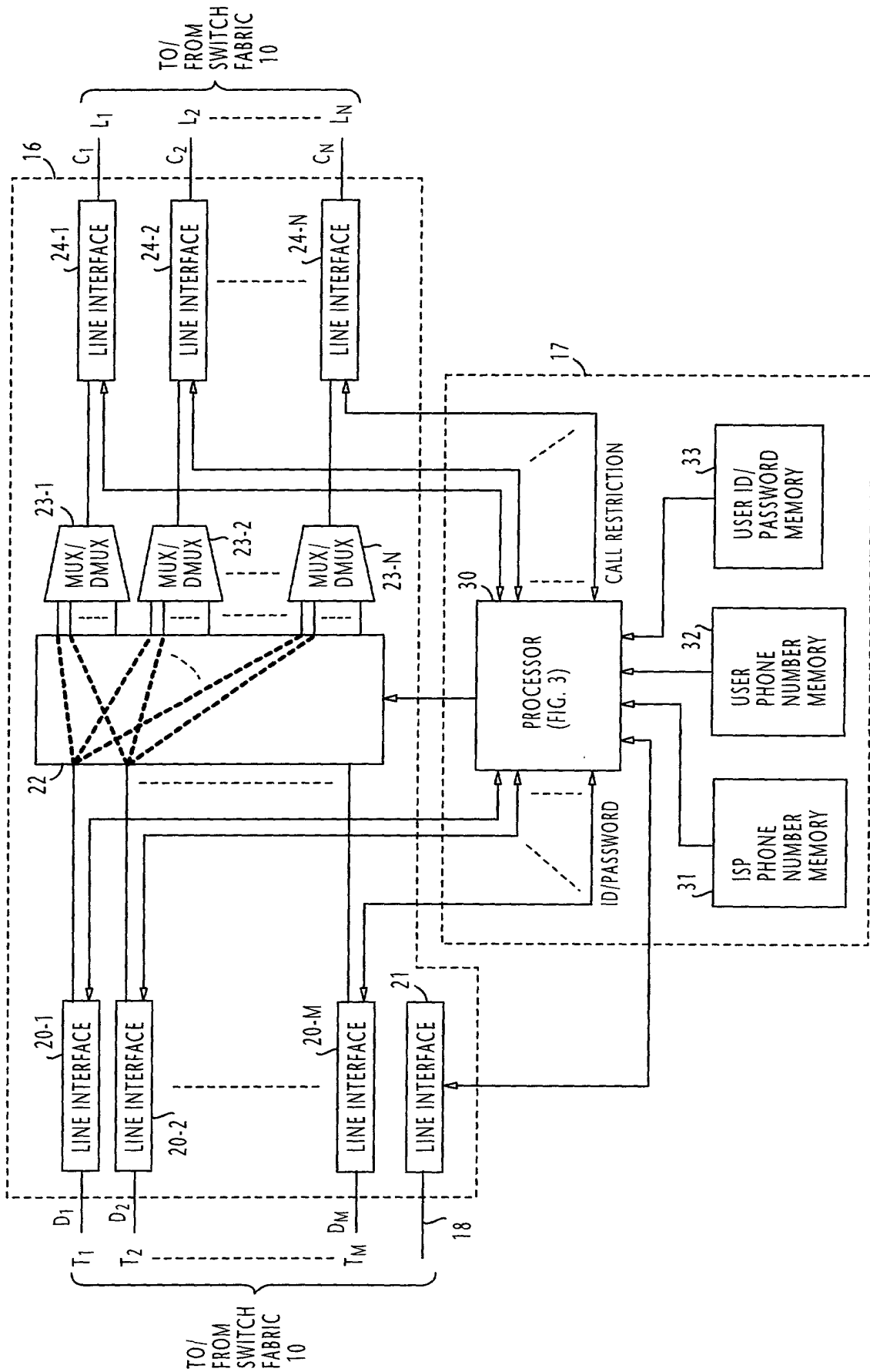
16   e)   repeating the steps (a), (b) and (d) by skipping the step (c) if said

17 plurality of connections are already established in said public network

18 switching system.
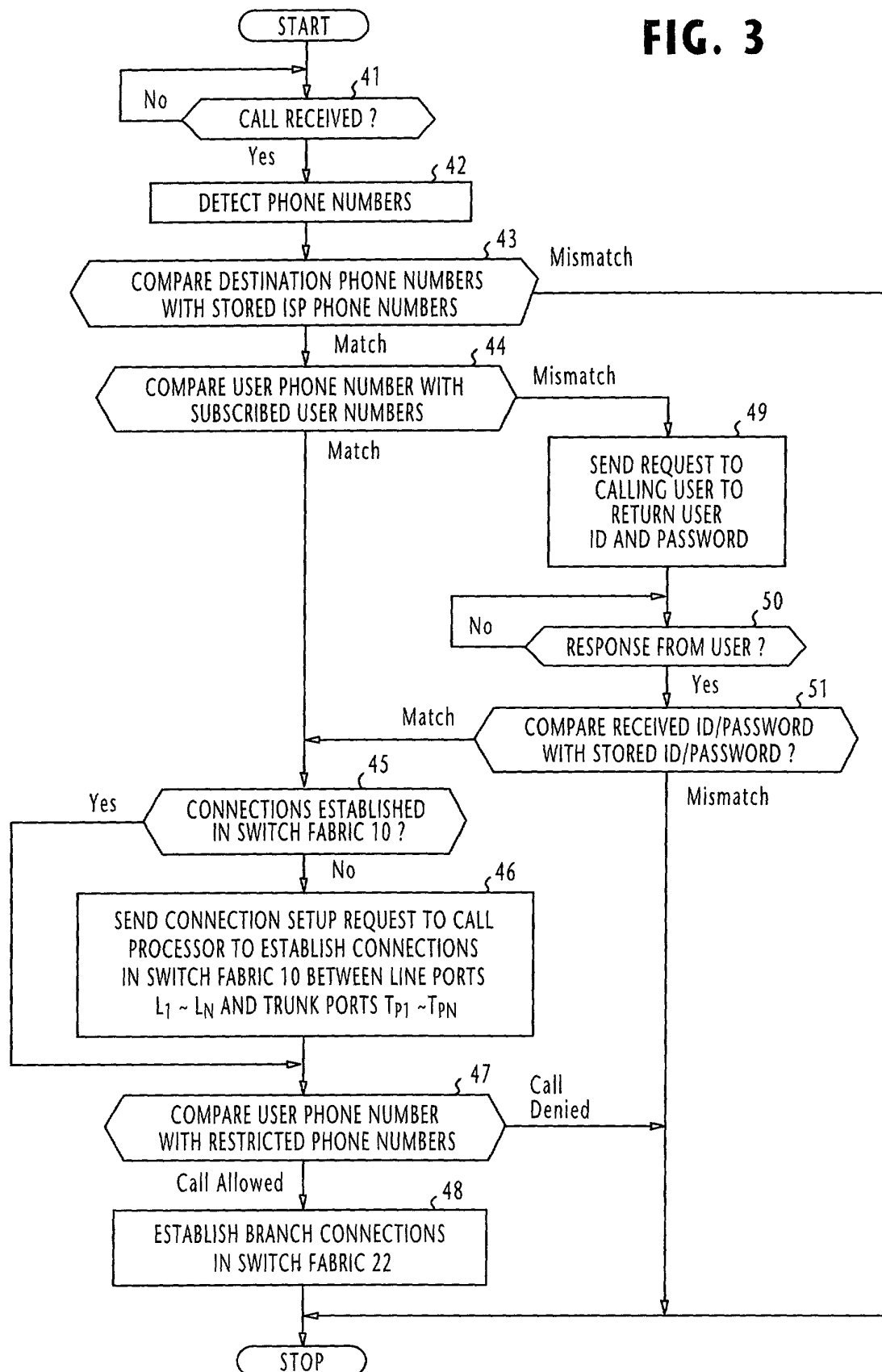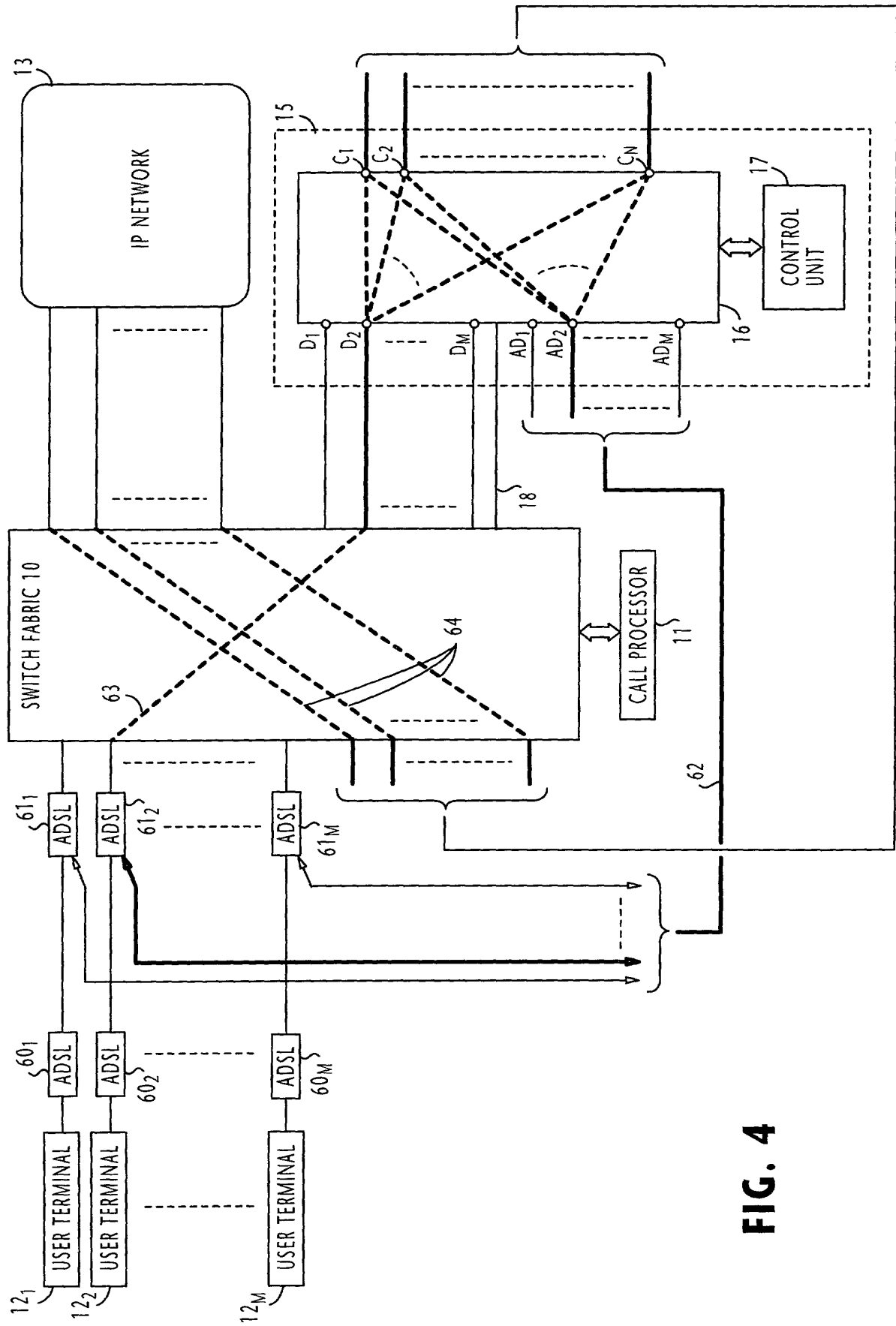
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ABSTRACT OF THE DISCLOSURE

1   A connection apparatus for a public network switching system includes

2   a switching unit having multiple diverging ports connected to the switching

3   system and multiple converging ports adapted for connection to a number of

4   internet lines. A control unit receives a request signal from a user terminal and

5   establishes in the switching unit a set of branch connections between one of the

6   diverging ports and the converging ports which correspond to internet lines

7   specified by the request signal, where the diverging port is connected through a

8   connection to the user terminal established in the switching system. The

9   internet lines may be directly connected to the switching system. The control

10 unit may request the switching system to establish multiple connections

11 between the converging ports and the internet lines. Each of the converging

12 ports may include a multiplexer for multiplexing a plurality of user signals into

13 a signal for transmission to one of the internet lines and a demultiplexer for

14 demultiplexing a signal from the internet line into a plurality of signals for

15 application to the diverging ports.

FIG. 1

FIG. 2

TO/FROM SWITCH FABRIC 10

16

L_1 C_1 LINE INTERFACE 24-1

L_2 C_2 LINE INTERFACE 24-2

L_N C_N LINE INTERFACE 24-N

23-1 MUX/DMUX

23-2 MUX/DMUX

23-N MUX/DMUX

22

17

30

CALL RESTRICTION

PROCESSOR (FIG. 3)

ID/PASSWORD

33 USER ID/PASSWORD MEMORY

32 USER PHONE NUMBER MEMORY

31 ISP PHONE NUMBER MEMORY

20-1 LINE INTERFACE

20-2 LINE INTERFACE

20-M LINE INTERFACE

21 LINE INTERFACE

18

D_1 T_1

D_2 T_2

D_M T_M

TO/FROM SWITCH FABRIC 10

FIG. 3

START

41
CALL RECEIVED ?
No

Yes

42
DETECT PHONE NUMBERS

43
COMPARE DESTINATION PHONE NUMBERS
WITH STORED ISP PHONE NUMBERS
Mismatch

Match

44
COMPARE USER PHONE NUMBER WITH
SUBSCRIBED USER NUMBERS
Mismatch

Match

49
SEND REQUEST TO
CALLING USER TO
RETURN USER
ID AND PASSWORD

50
RESPONSE FROM USER ?
No

Yes

51
COMPARE RECEIVED ID/PASSWORD
WITH STORED ID/PASSWORD ?
Match

Mismatch

45
CONNECTIONS ESTABLISHED
IN SWITCH FABRIC 10 ?
Yes

No

46
SEND CONNECTION SETUP REQUEST TO CALL
PROCESSOR TO ESTABLISH CONNECTIONS
IN SWITCH FABRIC 10 BETWEEN LINE PORTS
$L_1 \sim L_N$ AND TRUNK PORTS $T_{P1} \sim T_{PN}$

47
COMPARE USER PHONE NUMBER
WITH RESTRICTED PHONE NUMBERS
Call
Denied

Call Allowed

48
ESTABLISH BRANCH CONNECTIONS
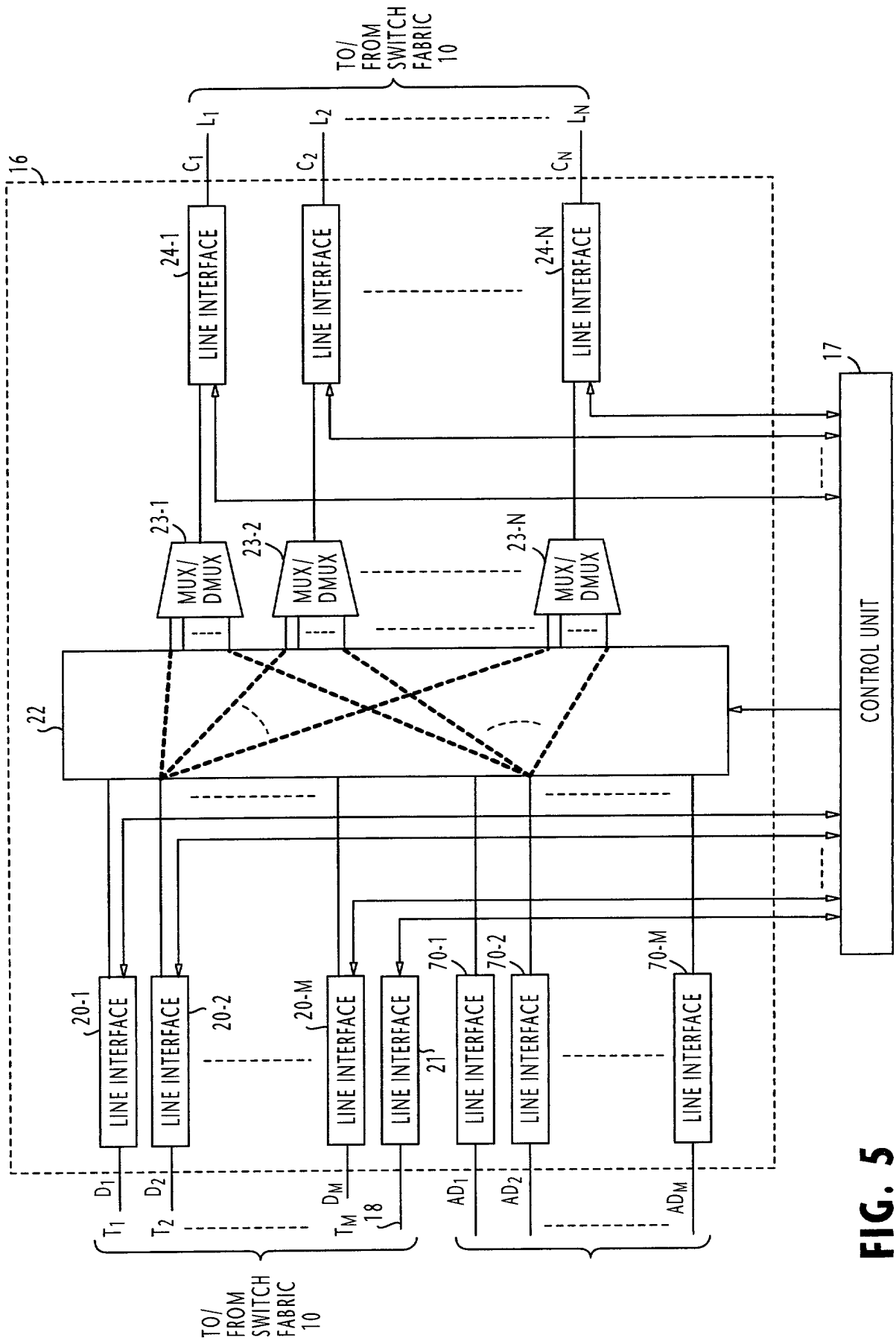IN SWITCH FABRIC 22

STOP

FIG. 4

FIG. 5

Application for United States Patent

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

APPARATUS AND METHOD FOR ESTABLISHING DIAL-UP BRANCH
CONNECTIONS TO INTERNET SERVICE PROVIDERS

the specification of which:

(check
one)

☒ is attached hereto

☐ was filed on _____, as
Application Serial No. _____
and was amended on _____.
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56*

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

			priority claimed
11-196694	Japan	09/07/1999	X
(Number)	(Country)	(Day/Month/Year Filed)	yes no
(Number)	(Country)	(Day/Month/Year Filed)	yes no
(Number)	(Country)	(Day/Month/Year Filed)	yes no

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

Power of Attorney: As a named inventor, I hereby appoint Sean M. McGinn, Reg. 34,386, and Frederick W. Gibb, III, Reg. No. 37,629 as attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. All correspondence should be directed to McGinn & Gibb, P.C., 1701 Clarendon Boulevard, Suite 100, Arlington, Virginia 22209. Telephone calls should be directed to McGinn & Gibb, P.C. at (703) 294-6699.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful

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アメリカ (長崎特許)

false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole
or First Inventor_____Saburou IKEDA_____

Inventor's Signature _____Saburou Ikeda_____ Date__June 29, 2000_____

Residence ____Tokyo, Japan_____

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Full Name of Second

Joint Inventor, If Any_____

Inventor's Signature _____ Date _____

Residence ,_____

Citizenship _____

Post Office Address _____

Full Name of Third

Joint Inventor, If Any _____

Inventor's Signature _____ Date _____

Residence _____

Citizenship _____

Post Office Address _____

Full Name of Fourth
Joint Inventor, If Any _____

Inventor's Signature _____ Date _____

Residence _____

Citizenship_____

Post Office Address _____

(An additional sheet(s) is/are attached hereto if the present invention includes more than four inventors.)

*Title 37, Code of Federal Regulations, § 1.56:

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith toward the Patent and Trademark Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and (1) it establishes , by itself or in combination with other information, a prima facie case of unpatentability; or (2) it refutes, or is inconsistent with, a position the applicant takes in: (i) opposing an argument of unpatentability relied on by the Office, or (ii) asserting an argument of patentability.